

XXXV. THE VALUE OF WHOLE POTATO IN HUMAN NUTRITION¹.

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THE potato is a very important constituent of the diet of many civilised nations, and it may be considered to furnish, with bread, the bulk of the food of the rural population of such countries as Poland and Russia. There is little doubt that the Polish or Russian peasant is nevertheless very healthy and able to do extremely hard work under trying conditions. Deficiency diseases such as beriberi, pellagra or scurvy are practically unknown in Poland.

For anybody acquainted with the diet and mode of life of the Polish peasant the high value of the potato as food would seem *a priori* to be well established. Students of nutritional problems, however, have very discrepant opinions concerning the value of potato. A careful review of earlier works and views relating to this problem is to be found in the papers of Hindhede [1913, 1, 2]. These are also the only experiments, so far as we are aware, which extend over long periods of time. It is well known that Hindhede and his collaborators were able to live over long periods of time on a diet in which the nitrogen was solely derived from whole potato. The experiments carried out both by his opponents and those who confirmed his opinions were of very short duration [Abderhalden, *et al.*, 1915; Lauter and Jenke, 1925; Rose and Cooper, 1917]. We therefore thought it advisable to repeat the investigations of Hindhede, continuing the experiment for several months. It was not primarily our intention to verify the contention of Hindhede concerning the question of potato minimum, but to see whether the potato would prove sufficient for the human adult as practically the sole source of nitrogen and the main source of calories.

The subjects were two healthy adults, a man aged 25, and a woman aged 28. They are subsequently referred to as (A) and (B) respectively. During the experiment they both did laboratory work, and (A) was also engaged in various sports. The diet consisted of potatoes, supplemented with butter or pork fat with the addition of a few fruits (apples and pears); tea or black coffee and sugar were also occasionally taken. The amount of fat consumed was not accurately estimated, it varied from 120–150 g. daily.

¹ This work was carried out in 1925, but the publication has been unavoidably delayed.

The potatoes were either steam-cooked unpeeled and then consumed with butter and salt, or fried. They were sometimes mashed after cooking, or sliced and made into salad with a little oil. In the later stages of the experiment it was found, however, that simple steam-cooked potatoes seemed the most palatable and this method of preparation was therefore generally used. Three meals daily were taken. The potatoes were weighed out for each meal and an endeavour was made to keep the food intake constant throughout the experiment. From time to time nitrogen balance periods were instituted. Urine was then collected and analysed daily, faeces were analysed in 2 or 3 day samples. Each metabolism period lasted 4 days, except period 4 of subject (A), which lasted 6 days. The whole experiment extended over 167 days, from Dec. 4, 1924 till May 20, 1925. The results of the nitrogen balance estimations are given in Tables I and II. The nitrogen content of the potatoes was 0.34 %.

Table I. *Subject (A).*

	Date	Daily intake of potatoes g.	Food-N g.	Urinary N g.	Faecal N g.	Total N excreted g.	N balance
Period I	22. xii. 24	1575	5.35	2.98	1.31	4.29	
	23. xii. 24	1500	5.10	3.63	1.31	4.94	
	24. xii. 24	1557	5.29	3.86	1.92	5.78	
	25. xii. 24	1610	5.47	3.79	1.92	5.71	
Daily average		1560	5.30	3.56	1.61	5.18	+0.12
Period II	12. i. 25	1770	6.02	3.07	2.32	5.39	
	13. i. 25	1746	5.94	2.77	2.32	5.09	
	14. i. 25	1758	5.98	3.11	2.05	5.16	
	15. i. 25	1758	5.98	3.56	2.05	5.61	
Daily average		1758	5.98	3.13	2.18	5.31	+0.67
Period III	2. ii. 25	1624	5.52	3.06	1.47	4.53	
	3. ii. 25	1638	5.57	3.70	1.47	5.17	
	4. ii. 25	1720	5.85	3.53	2.36	5.89	
	5. ii. 25	1661	5.65	3.52	2.36	5.88	
Daily average		1661	5.65	3.45	1.91	5.37	+0.28
Period IV	15. v. 25	1741	5.92	2.55	2.01	4.56	
	16. v. 25	1725	5.86	2.56	2.01	4.57	
	17. v. 25	1794	6.10	2.11	2.01	4.12	
	18. v. 25	1736	5.90	2.92	2.12	5.04	
	19. v. 25	1764	6.00	2.58	2.12	4.70	
	20. v. 25	1752	5.96	3.18	2.12	5.30	
Daily average		1752	5.96	2.65	2.06	4.71	+1.25

It will be seen that nitrogen equilibrium was attained by both subjects, by (A) more rapidly than by (B).

Body weight was nearly constant during the whole experiment. The sudden loss of weight of subject (A) towards the end of the experiment was perhaps associated with the beginning of a more intensive training (Table III).

The digestion was excellent throughout the experiment and both subjects felt very well. They did not tire of the uniform potato diet and there was no craving for change.

Table II. *Subject (B).*

	Date	Daily intake of potatoes g.	Food-N g.	Urinary N g.	Faecal N g.	Total N excreted g.	N balance
Period I	22. xii. 24	1075	3.65	3.62	1.60	5.22	
	23. xii. 24	1005	3.42	3.74	1.60	5.34	
	24. xii. 24	1115	3.79	3.64	2.03	5.67	
	25. xii. 24	900	3.06	3.22	2.03	5.25	
	Daily average	1024	3.48	3.55	1.81	5.37	-1.89
Period II	12. i. 25	1330	4.52	3.54	1.70	5.24	
	13. i. 25	1230	4.18	2.21	1.70	3.91	
	14. i. 25	1293	4.39	2.92	1.16	4.08	
	15. i. 25	1318	4.48	3.73	1.16	4.88	
	Daily average	1293	4.39	3.10	1.43	4.53	-0.14
Period III	2. ii. 25	1112	3.78	4.03	1.57	5.60	
	3. ii. 25	1200	4.08	3.37	1.57	4.94	
	4. ii. 25	1305	4.44	3.02	1.67	4.69	
	5. ii. 25	1050	3.57	2.64	1.67	4.31	
	Daily average	1167	3.97	3.26	1.62	4.88	-0.91
Period IV	15. v. 25	925	3.14	2.27	0.90	3.17	
	16. v. 25	1008	3.43	2.40	0.90	3.30	
	17. v. 25	979	3.33	2.70	0.87	3.57	
	18. v. 25	1243	4.22	2.84	0.87	3.71	
	Daily average	1039	3.53	2.55	0.88	3.44	+0.09

Table III.

Date	Dec. 4	Dec. 18	Jan. 2	Jan. 16	Jan. 30	Feb. 13	Feb. 27
Body-weight kg. A		64.6	64.0	62.5	62.6	62.9	64.1	64.6
B		63.5	62.8	62.5	62.3	62.4	61.8	61.3
Date	Mar. 13	Mar. 22	Apr. 11	Apr. 24	May 9	May 16	
Body-weight kg. A		64.3	64.5	64.9	64.2	62.7	61.3	
B		60.8	61.3	61.8	61.8	—	61.7	

We think that our results must be looked upon as a confirmation of the experiment of Hindhede, and the high value of potato as a source of nitrogen for the human adult seems to be confirmed.

SUMMARY.

An experiment is described in which two adults, a man and a woman, lived over a period of 167 days in nitrogen equilibrium and in good health on a diet in which the nitrogen was practically solely derived from the potato. The daily nitrogen intake was on the average 5.7 g. for the man and 3.8 g. for the woman.

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